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FORECAST OF SERIOUS WHEAT LEAF RUST EPIPHYTOTIC

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

FORECAST OF SERIOUS WHEAT LEAF RUST EPIPHYTOTIC

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The exceptionally favorable late winter and early spring weather have permitted such increase in wheat leaf rust [Puccinia rubigo-vera var. tritici] that a severe epiphytotic, perhaps equal in intensity to that of 1938, is anticipated.

Counts of rust at 10-day intervals in a representative field of Turkey wheat in 1944 and 1945 show the following striking contrasts.

Date		Rust pustules/leaf*		Ratio, 1944:1945
1944	1945	1944	1945	
I-31	II-1	.091	12.7	1:134
II-9	II-11	.024	19.5	1:810
II-19	II-20	.010	51.6	1:5,000
III-1	III-1	.0003	45.0	1:150,000
III-11	III-11	.144	14.5	1:101
III-21	III-21	.022	24.7	1:1,120
III-31	IV-1	.004	70.1	1:17,525

*Considering only living leaves old enough to have had time for pustules to develop if infection occurred.

Thus, on April 1, 1945, at the end of the "critical month"¹ and the beginning of the period during which temperatures and moisture are regularly favorable for rust reproduction in Oklahoma, there was more than 17,000 times as much rust present as on a corresponding date in the light rust year, 1944. The present rust intensity and a marked increase during the next 10 days are associated with the fact that on 23 of the past 24 days at the point of observation the temperature for a considerable part of the day has been between 60° and 65° F, optimal for rust reproduction. Dews have been abundant, and there is sufficient moisture in the soil, even in the lack of rain, for many dewy nights to come. Leaf rust spores were being deposited on spore traps at Stillwater in March, 1945, with a frequency that was not reached until mid-May in 1944.

The data show that on only one 10-day interval in February-March, 1945, was there a marked decrease in the amount of leaf rust. This was on the March 11 reading and was due to 21° F freezes on March 6 and 7 which destroyed the leaves that were heavily laden with rust, reducing the foliation from an average of 5 leaves per tiller to 3 1/2 leaves. The minor

¹Cf. PDR 26: 213-217, 1942; Suppl. 143, 1943; and PDR 28: 280-287, 1944

decrease of March 1 also followed a similar freeze February 26-28.

While observations reported above were confined to the vicinity of Stillwater, Oklahoma, they are indicative of a situation that involves the entire Southwest. From Texas, A. W. Erickson² reported on February 26 that "Orange leaf rust pustules are easily found (with some leaves well plastered with new pustules) on both sides of the Red River and south. Southern experiment stations (200 miles south of Denton) report a heavy infestation of orange leaf rust. It now appears as tho' we will see a heavy leaf rust epidemic beginning very early."

On March 26, Dr. H. R. Rosen³ wrote from Arkansas that there was more leaf rust than he had seen for several years. "We can, therefore, expect a very severe epidemic of leaf rust in this State given normal or average spring temperature and rainfall. If these turn out to be above average, we are likely to remember this year as one of the worst years of rust in Arkansas."

From Kansas, C. O. Johnston³ wrote on February 27, "It certainly looks as though we are headed for a leaf rust epidemic in the central Plains area . . . The stage seems to be perfectly set for the early development of leaf rust unless we obtain some severe weather soon." On March 23 he added that "Leaf rust has moved into southern Kansas in fair abundance but has not yet appeared in abundance as far north as Manhattan; however, it is easy to find in our experimental plots and nearby fields where it has overwintered apparently in the mycelium stage."

To determine whether the exceptional development noted near Stillwater was characteristic of Oklahoma as a whole, the junior author made 2 inspection trips, sampling wheat fields throughout the greater part of the wheat-growing area of the State. On the average, 2 fields were examined every 10 miles of the route. The first trip, March 25-28, followed the route: Stillwater to Oklahoma City, Chickasha, Lawton, Grandfield, Davidson, Altus, Hobart, Clinton, El Reno, Hennessey, to Stillwater.

The second trip, March 29-30, was made in company with Dr. Paul R. Miller, and followed the route: Stillwater to Kingfisher, Watonga, Woodward, Buffalo, Alva, Cherokee, Pondcreek, Enid, Perry, to Stillwater.

Five to ten minute examinations of 112 fields were made. Leaf rust was observed in varying amounts in all of the fields surveyed. The intensity of the rust varied from 5% to 65% according to the modified Cobb scale ("U.S.D.A scale"). Wheat fields were observed in the following counties, and the incidence of rust estimated according to this scale: Harper, Woodward, Ellis, Dewey, Blain, and Washita, an average of 25%; Grady, Canadian, Kingfisher, Garfield, Alfalfa, Grant, Logan, and Payne, an average of 40%; Comanche, Tillman, Jackson, and Kiowa an average infection between 40 and 65%. From Garfield to Woods County and in Tillman County, some of the fields showed a marked yellow cast, due to the rust. In comparison with 1938, on the same date, this represents nearly as heavy rust in the west-central tier of counties and much heavier rust in the western counties.

Specimens were collected from the various areas and taken to the laboratory for verification. No stem rust was present on these specimens,

² Cargill Crop Bull. 20 (3): 28-30. March 22, 1945

³ Correspondence, cited with author's permission

nor was any observed in the field.

In trial plantings at Lawton and Woodward, varieties such as Westar, Austin, Comanche, and Pawnee, had leaf rust infections, but much less than ordinary susceptible commercial varieties.

Thus on the basis of the data from Oklahoma, supported by reports from adjacent States, losses from leaf rust in 1945 could rank with those of 1919, 1922, and 1938 if conditions favorable for the development of leaf rust continue. Wheat of susceptible varieties may be expected to suffer serious reductions of potential yields, in both quantity and quality, while late-maturing stands, and wheat growing in wet bottom lands or in soil that is rich in nitrogen, may be expected, in many cases, to give very disappointing harvest returns. On upland sites, in less fertile soils, the high moisture level and other favorable factors may be expected to so raise the potential yields that even a 20 or 30% reduction of potential yield due to leaf rust will leave yields that will not markedly fall short of long-time average yields.

Two differences between the 1938 and 1945 seasons are noteworthy. In the first place, the effect of leaf rust in 1938 was obscured by numerous other factors injurious to wheat⁴, including an April freeze and insect damage. Thus far in 1945 the rust situation is relatively uncomplicated by such factors, beyond a moderate greenbug infestation, and accordingly, 1945 promises to present a reasonably clear-cut picture of the destructiveness of leaf rust, barring future complications.

Secondly, in 1938 there were no commercial wheat varieties in the Southwest that could be classed as moderately resistant to leaf rust, although certain varieties appeared more tolerant of the rust than others. This year there are substantial acreages of such moderately rust-resistant varieties as Comanche, Austin, Pawnee, and Westar, and, in the event of epiphytotic leaf rust these may be expected to provide both a measure of rust destructiveness and an object lesson in the value of the leaf rust-resistant wheat varieties for the Southwest. Westar in particular, which is resistant to leaf rust but very susceptible to stem rust, should afford opportunity to differentiate the effects of these two diseases, especially if its behavior is compared with that of Austin, which is resistant to both rusts, and with other commercial varieties which are susceptible to both.

OKLAHOMA AGRICULTURAL EXPERIMENT STATION AND
EMERGENCY PLANT DISEASE PREVENTION PROJECT
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⁴ Cf. PDR Supplements 112 and 116, 1939

CEREAL RUST SITUATION IN THE SOUTHERN PLAINS AREA

C. O. Johnston

The past winter was one of the mildest on record throughout the entire hard red winter wheat belt. Only in the western part of the area on the high plains did minimum temperatures reach zero and even there periods of severe cold were of short duration. At Manhattan, Kansas, the lowest temperature was 5° F on December 31. Precipitation in the form of rain or snow was far above normal at most places in the area throughout the winter months and the ground remained wet until the last week in March.

These conditions combined with early sowing and excellent fall conditions resulted in excellent survival and vigor of winter wheat throughout the area. There has been far less dying of lower leaves than normal and very little spring yellowing. We therefore have the unusual situation of vigorously growing plants that are green right down to the ground. Mild weather during February and March started spring growth and in most localities winter wheat is far ahead of normal in its development.

There was an unusually heavy development of leaf rust on volunteer and early sown wheat during October and November. By January that infection had disappeared and the lowermost infected leaves had dried up. Such fields in Kansas were about the only ones in which the plants had dead leaves at the base. Observations made throughout the winter and spring indicate that overwintering was no more abundant in fields that were heavily infected last fall than in fields that were not severely rusted.

However, leaf rust has overwintered in unusual abundance throughout the entire southern plains area. Evidence at hand indicates that most of the overwintering in Kansas occurred in the form of dormant mycelium resulting from fall infections. Uredia began developing on leaves on or near the ground during February and secondary infections now are becoming conspicuous. South of Kansas leaf rust undoubtedly survived the winter in some localities in the form of viable uredia. Mr. C. M. Slagg of the Emergency Plant Disease Prevention program reports finding uredia of leaf rust in every county he visited in Kansas during March. His surveys included the southwestern part of the State from Manhattan to Hays, to Hugoton (Morton County), and the southeastern part of the State. In the southwestern section infection was mostly in the form of scattered uredia on leaves near the ground, but in the southeastern section secondary infections already were developing on new leaves 4 to 8 inches above the ground.

The writer remembers no instance in the past 20 years when infections of leaf rust of wheat have been so widespread and so far advanced at this time of year. In Kansas the infection is more than a month ahead of normal and unless severe late spring freezes, or drought, occur during April and May a major epidemic seems certain to develop. One factor that may reduce the losses that could occur is the early maturity of the crop. Winter wheat has just passed through a mild, favorable winter and has started rapid spring growth earlier than usual. An unusually early harvest therefore is in prospect.

The only other cereal rust now conspicuous in the area is leaf rust [Puccinia rubigo-vera var. secalis] of rye. Occasional patches of rye

have considerable infection. No stem rust of either wheat or rye has been seen by the writer and no reports of stem rust have been received from any point in the area.

Owing to wet soil seeding of oats again was greatly delayed in northern Kansas. Many farmers failed to plant even the small acreage they had intended to plant. Oats are certain to be late and therefore are likely to be severely rusted. Considerable Boone, Tama, and Vicland was sown in northern counties but most of the oats in the state still are either Kanota or Fulton.

U. S. BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, DIVISION OF CEREAL CROPS AND DISEASES